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EXAMINER
CHOI, WILLIAM C

ART UNIT	PAPER NUMBER
2873	

DATE MAILED: 10/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/032,198	NOVOTNY ET AL.	
	Examiner	Art Unit	
	William C. Choi	2873	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 December 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-41* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *26-29* is/are allowed.

6)☒ Claim(s) *1-4,6-14,16,19-25 and 30-32* is/are rejected.

7)☒ Claim(s) *5,15,17,18,33 and 34* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 December 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2,4,5* .
4) ☒ Interview Summary (PTO-413) Paper No(s). *0903* .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-34, drawn to an actuator assembly, classified in class 359, subclass 225.

II. Claims 35-41, drawn to a method of forming MEMS structures, classified in class 216, subclass 24.

The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the process as claimed can be used to make other and materially different product such as a MEMS device having member arms of any shape.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with Arthur Behiel on September 8, 2003 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-34. Affirmation of this election must be made by applicant in replying to this Office action. Claims 35-41 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

DETAILED ACTION

Priority

Applicant's claims for domestic priority under 35 U.S.C. 119(e) and 120 are acknowledged.

Information Disclosure Statement

Receipt of the Information Disclosure Statements (IDS's) with the copies of the references cited therein, were received on 12/20/2001, 2/15/2002 and 10/21/2002. Initialized copies of the IDS's are enclosed with this office action.

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, in Figure 1A, applicant must show how hinge portion "119T" is connected to frame portion "111T" to constitute

a first fulcrum axis or the feature(s) must be canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 6-10, 12-14, 16, 19-25 and 30-32 are rejected under 35 U.S.C. 102(e) as being anticipated by Behin et al (U.S. 2002/0005976 A1).

In regards to claim 1, Behin discloses an actuator assembly (pages 4 and 5, section [0039], Figure 1D) comprising: an actuator support (page 5, section [0039], last 2 lines, Figure 1D, "102"); a fixed comb connected to the actuator support (page 5, section [0040], Figure 1D, "112 (Top)") and having a plurality of fixed teeth extending in a first direction (page 5, section [0040], Figure 1D, "111 (Top)"); a member frame flexibly connected to the actuator support (page 5, section [0040], Figure 1D, "104") and having a first fulcrum axis (page 5, section [0040], Figure 1D, "126"); a movable comb

connected to the member frame (page 5, section [0040], Figure 1D, "114 (Top)"), and having a plurality of movable teeth extending in the first direction (page 5, section [0040], Figure 1D, "113 (Top)"), wherein the fixed and movable teeth are arranged interdigitally from a perspective perpendicular to the first direction and the first fulcrum axis (Figure 1D, "111 (Top)" and "113 (Top)"); and an actuated member connected to the member frame and movable with respect to the member frame (page 5, section [0040], Figure 1D, "106") along a second fulcrum axis (page 5, section [0040], Figure 1D, "124").

Regarding claim 2, Behin et al discloses wherein the second fulcrum axis is perpendicular to the first fulcrum axis (Figure 1D, "126" and "124").

Regarding claim 3, Behin et al discloses said assembly further comprising: a frame comb rigidly connected to the member frame (page 5, section [0039], Figure 1D, "116 (Left)") and having a plurality of frame-comb teeth extending in a second direction different from the first direction (page 5, section [0039], Figure 1D, "115 (Left)"); and a member comb rigidly connected to the member (page 5, section [0039], Figure 1D, "118 (Left)") and having a plurality of member teeth extending in the second direction (page 5, section [0039], Figure 1D, "117 (Left)"); wherein the frame-comb teeth and the member teeth are arranged interdigitally from the perspective perpendicular to the first direction and the first fulcrum axis (Figure 1D, "115 (Left)" and "117 (Left)").

Regarding claim 4, Behin et al discloses wherein the second direction is perpendicular to the first direction (Figure 1D, "115 (Left)" and "111 (Top)").

Regarding claim 6, Behin et al discloses said assembly further comprising

a hinge connecting the member frame to the actuator support (page 5, section [0040], Figure 1D, "110").

Regarding claim 7, Behin et al discloses wherein the hinge comprises a flexible member (page 5, section [0040], re "rotatable flexure").

Regarding claim 8, Behin et al discloses said actuator support further comprising: a second fixed comb rigidly connected to the actuator support (Figure 1D, "112 (Bottom)") and having a second plurality of fixed teeth extending in the first direction (Figure 1D, "111 (Bottom)"); a second movable comb rigidly connected to the member frame (Figure 1D, "114 (Bottom)") and having a second plurality of movable teeth extending in the first direction (Figure 1D, "113 (Bottom)"); wherein the second plurality of fixed teeth and the second plurality of movable teeth are arranged interdigitally from the perspective perpendicular to the first direction and the first fulcrum axis (Figure 1D, "111 (Bottom)" and "113 (Bottom)").

Regarding claim 9, Behin et al discloses said actuator assembly further comprising: a second frame comb rigidly connected to the member frame (Figure 1D, "116 (Right)") and having a second plurality of frame-comb teeth extending in the second direction (Figure 1D, "115 (Right)"); a second member comb rigidly connected to the member (Figure 1D, "118 (Right)") and having a second plurality of member teeth extending in the second direction (Figure 1D, "117 (Right)"); wherein the second plurality of frame-comb teeth and the second plurality of member teeth are arranged interdigitally from the perspective perpendicular to the first direction and the first fulcrum axis (Figure 1D, "115 (Right)" and "117 (Right)").

Regarding claim 10, Behin et al discloses wherein the member comprises a mirror surface (page 5, section [0040], lines 1-3).

Regarding claim 12, Behin et al discloses wherein the actuator assembly occupies a first area in a plane defined by first fulcrum axis and the second fulcrum axis (Figure 1D, "126" and "124"), and wherein the mirror surface occupies a second area at least one fourth the area of the first area (Figure 1D, "106").

Regarding claim 13, Behin et al discloses wherein the fixed comb comprises a semiconductor (pages 5 and 6, section [0045]).

Regarding claim 14, Behin et al discloses said actuator assembly further comprising a hinge connecting the member frame to the actuator support (Figure 1D, "110"), wherein the hinge is thinner than the fixed comb in a second direction perpendicular to the first and second axes (page 3, sections [0022] and [0023], Figure 1A, "34" and "14").

Regarding claim 16, Behin et al discloses wherein the hinge is serpentine (Figure 1A, "34").

Regarding claim 19, Behin et al discloses wherein the first fulcrum axis (Figure 1D, "126") bisects the actuated member (Figure 1D, "106").

Regarding claim 20, Behin et al discloses wherein the second fulcrum axis (Figure 1D, "124") bisects the actuated member (Figure 1D, "106").

Regarding claim 21, Behin et al discloses said actuator assembly further comprising a torsional hinge connected between the actuator support and the fixed comb (page 5, section [0040], Figure 1D, "110").

Regarding claim 22, Behin et al discloses said actuator assembly further comprising an integrated circuit bonded to the actuator support and adapted to supply control voltages to at least one of the fixed and movable combs (pages 3-4, section [0029], Figure 1A).

In regards to claim 23, Behin et al discloses an actuator assembly comprising: an actuator support (page 5, section [0040], Figure 1D, "104"); a first comb means connected to the actuator support (page 5, section [0039], Figure 1D, "116 (Left)"); an actuated member flexibly connected to the actuator support (page 5, section [0040], Figure 1D, "106"); a second comb means connected to the actuated member and adapted to move relative to the first comb means to position the actuated member (page 5, section [0039], Figure 1D, "118 (Left)"); wherein the actuated member rotates in a first dimension along a first fulcrum axis with respect to the actuator support (Figure 1D, "126"); and wherein the actuated member rotates in a second dimension along a second fulcrum axis with respect to the actuator support (Figure 1D, "124").

Regarding claim 24, Behin et al discloses wherein the actuated member is adapted to move in a third dimension with respect to the actuator support (Figure 1D, i.e. when the actuated member is fully rotated in either "124" or "126" with the other axis still being actuated about the fulcrum).

Regarding claim 25, Behin et al discloses said assembly further comprising a mirror disposed on the actuated member (page 5, section [0040], lines 1-3).

In regards to claim 30, Behin et al discloses an actuator (pages 4 and 5, section [0039], Figure 1D) comprising: an actuator support (page 5, section [0040], Figure 1D,

"104"); an actuated member movably connected to the actuator support (page 5, section [0040], Figure 1D, "106"); a first set of interdigitated combs adapted to pivot the actuated member relative to the actuator support along a first fulcrum axis (page 5, section [0040], Figure 1D, "112" and "114") in response to a first applied voltage (page 5, section [0042], Figure 1D, "122"); and a second set of interdigitated combs adapted to move the actuated member relative to the actuator support along a second fulcrum axis (page 5, section [0039], Figure 1D, "116" and "118") in response to a second applied voltage (page 5, section [0042], Figure 1D, "120").

Regarding claim 31, Behin et al discloses wherein the actuated member is adapted to move relative to the actuator support in a plane parallel to the first and second fulcrum axes (Figures 1D and 2E).

Regarding claim 32, Behin et al discloses wherein the actuated member pivots in the plane (Figure 1A).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Behin et al as applied to claim 1 above, and further in view of Miller et al (U.S. 2002/0171327 A1).

Regarding claim 11, Behin et al discloses as set forth above but does not specifically disclose wherein the mirror surface comprises gold. Within the same field of endeavor, Miller et al teaches that it is well known in the art for mirror surfaces of actuator assemblies to comprise gold (pages 5-6, section [0071]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the mirror surface of Behin et al to comprise gold since Miller et al teaches that it is well known in the art for mirror surfaces of actuator assemblies to comprise gold.

Allowable Subject Matter

Claims 26-29 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to teach a combination of all the claimed features as presented in claims 26-29: an actuator comprising first and second sets of teeth connected to an actuator support and third and fourth sets of teeth connected to an actuated member as claimed, specifically wherein the first and third sets and the second and fourth sets of teeth are arranged interdigitally from at least one perspective, the teeth of the fourth set of teeth extend in parallel with the teeth of the second set of teeth and wherein the teeth of the first and second sets are not parallel.

Claim 5, 15, 17, 18, 33 and 34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art fails to teach a combination of all the claimed features as presented in claim 5: an actuator assembly as claimed, specifically comprising a hinge including a first portion electrically connected to the frame comb, which is electrically insulated from a second portion electrically connected to the member teeth.

The prior art fails to teach a combination of all the claimed features as presented in claim 15, an actuator assembly as claimed, specifically wherein the hinge comprises two electrically conductive portions separated by an electrically insulating portion.

The prior art fails to teach a combination of all the claimed features as presented in claim 17, an actuator assembly as claimed, specifically wherein the fixed teeth are of varying length.

The prior art fails to teach a combination of all the claimed features as presented in claim 18, an actuator assembly as claimed, specifically wherein the movable teeth are of varying length.

The prior art fails to teach a combination of all the claimed features as presented in claim 33, an actuator as claimed, specifically wherein the actuated member is adapted to simultaneously move translationally and rotationally relative to the actuator support.

The prior art fails to teach a combination of all the claimed features as presented in claim 34, an actuator as claimed, specifically wherein the actuated member is adapted to simultaneously move relative to the actuator support translationally in two directions and rotationally.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William C. Choi whose telephone number is (703) 305-3100. The examiner can normally be reached on Monday-Friday from about 9:00 am to 6 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y. Epps can be reached on (703) 308-4883. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

W.C.
William Choi
Patent Examiner
Art Unit 2873
September ***, 2003

Georgia Epps
Supervisory Patent Examiner
Technology Center 2800